(12) UK Patent Application (19) GB (11) 2 287 655 (13) A

(43) Date of A Publication 27.09.1995

(21) Application No 9404804.8

(22) Date of Filing 11.03.1994

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(51) INT CL^6
A61M 16/00 , F15D 1/14

(52) UK CL (Edition N)
A5T TDJ
G3H HCA H101
U1S S1046

(56) Documents Cited
None

(58) Field of Search
UK CL (Edition N) A5T TAD TDJ TDK TDX , G3H HCA HCX
INT CL^6 A61M 13/00 16/00 , F15D 1/00 1/14
Online: WPI

(54) A T-piece for use with a fuel cell gas sensor

(57) The T-piece 2 comprises a body part 8, a through bore 10, a leg part 12, a bore 14 which communicates with the bore 10, and obturator means 16 which is positioned in the bores in order to partially block both bores. The fuel cell gas sensor 4 may be used in a ventilation circuit 6 for ventilating a patient's lungs. The obturator means causes the air from the patient's lungs to flow through the T-piece and over the fuel cell gas sensor in an efficient manner to give accurate and consistent readings.

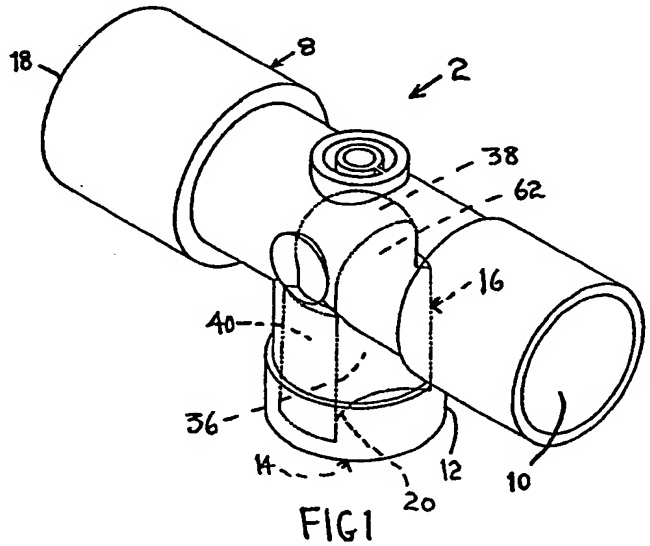

FIG1

GB 2 287 655 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

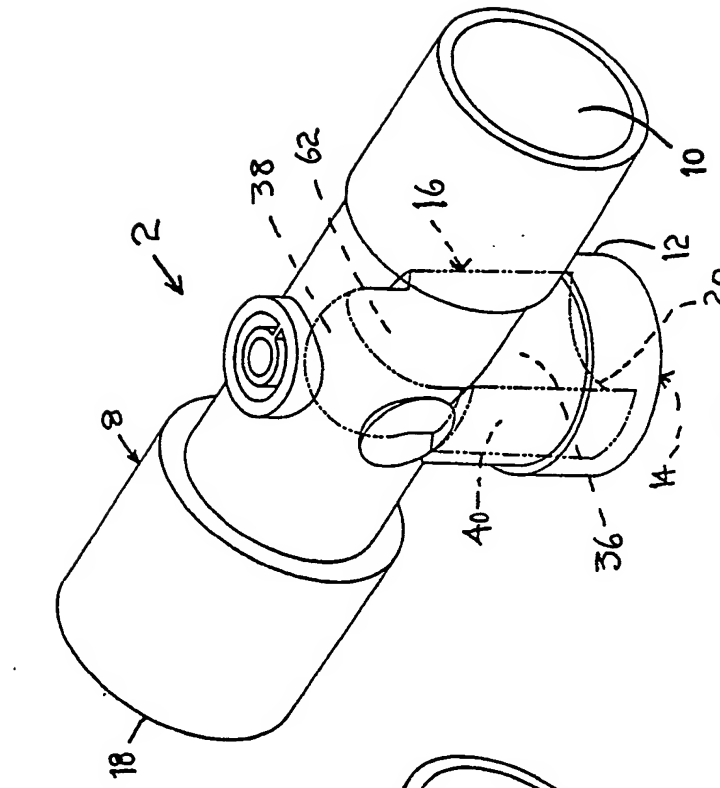

FIG1

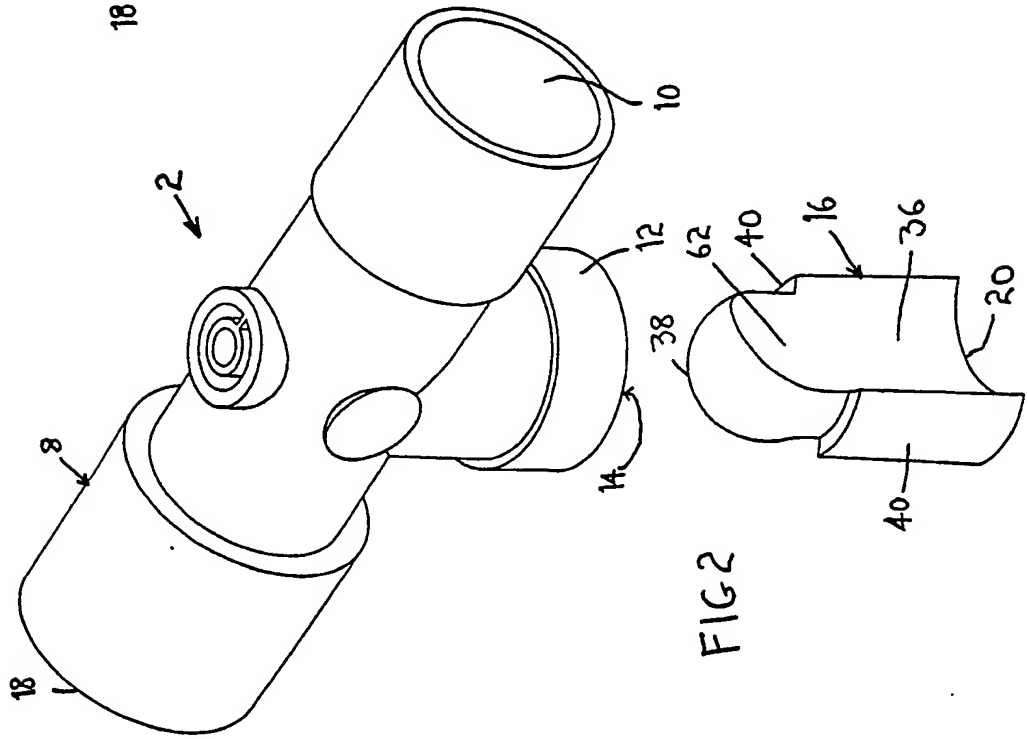

FIG2

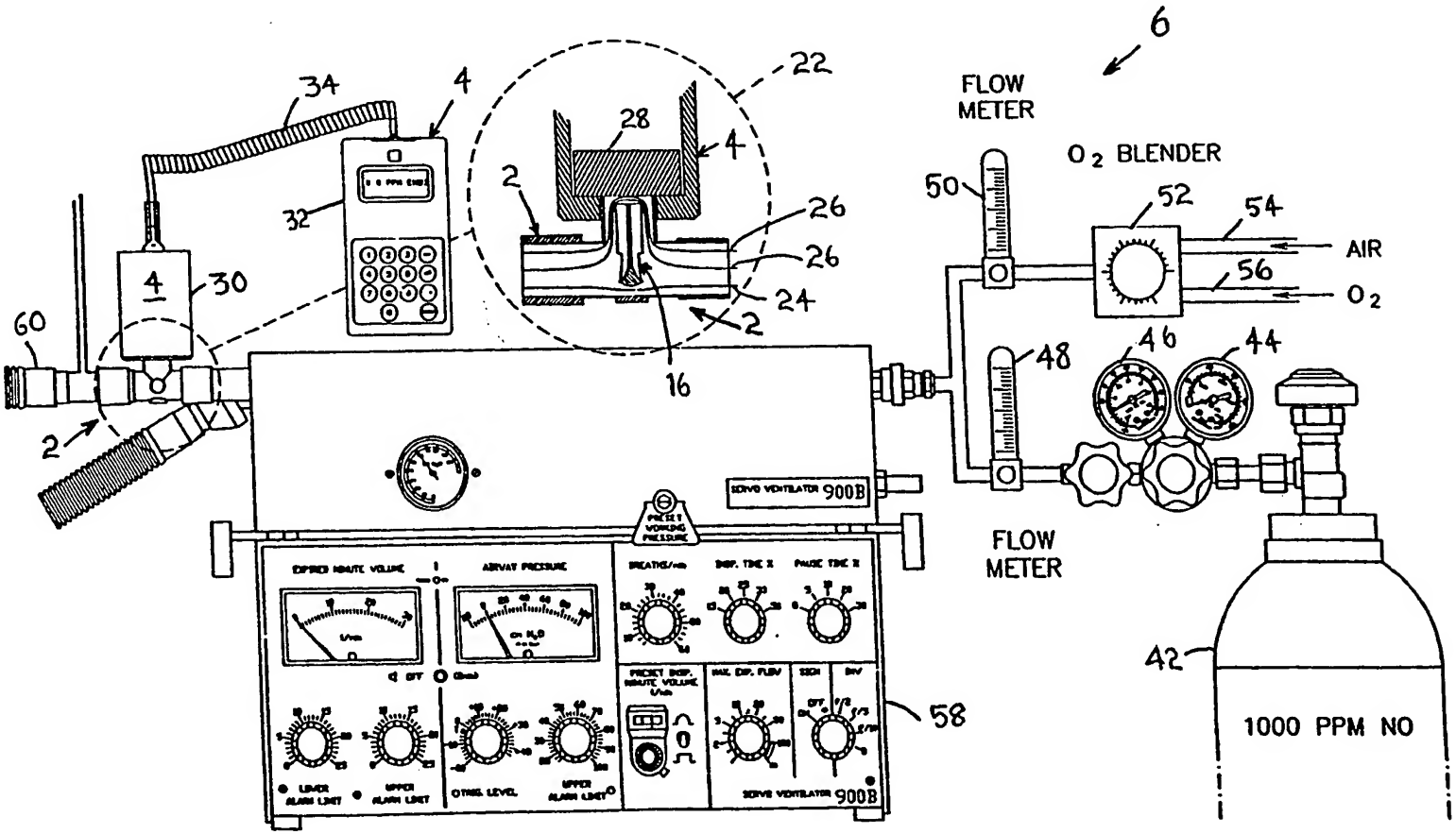
6
FLOW METER
O_2 BLENDER
50
52
54
AIR
56
O_2
48
46
44
FLOW METER
42
1000 PPM NO
34
4
32
30
60
2
22
28
26
24
16
58
SERVO VENTILATOR 900B

FIG 3

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A T-PIECE FOR USE WITH A FUEL CELL GAS SENSOR

This invention relates to a T-piece for use with a fuel cell gas sensor, for example a fuel gas sensor that is in a ventilation circuit for ventilating a patient's lungs.

In hospitals, nursing homes and similar establishments, it is often necessary to measure the concentration of a gas. For example, intensive care units in hospitals often administer nitric oxide gas to patients and it is essential to know the concentration of the gas. Examples of other gases often requiring to be measured for their concentration are oxygen, and carbon monoxide. The concentration of the gases is usually measured by a gas sensor having gas sensing means in the form of a fuel cell. The fuel cell reacts with the gas under test in order to give a measurement of the concentration of the gas.

The fuel cell gas sensors often do not work sufficiently accurately and consistently due to the fact that their readings vary with flow rate. This is an important factor when it is considered that the patient may be a small child only able to give relatively small puffs of air or an adult able to give much larger puffs of air. Air from the patient's lungs is usually blown

through a T-piece comprising a body part, a through bore in the body part, a leg part which extends at right angles from the body part, and a bore in the leg part which communicates with the bore in the body part. The fuel cell gas sensor is connected to the leg part of the T-piece.

The present invention is based upon two observations. Firstly the fuel cell needs a good positive flow over its surface in order to work at its best. Secondly, when a patient blows air through the T-piece, the air tends to go directly through the bore in the body part and not enough air tends to go along the bore in the leg part to the fuel cell of the gas sensor.

Thus, in accordance with one non-limiting embodiment of the present invention, there is provided a T-piece for use with a fuel cell gas sensor, which T-piece comprises a body part, a through bore in the body part, a leg part which extends at right angles from the body part, a bore in the leg part which communicates with the bore in the body part, and obturator means which is positioned in the bore in the body part and in the bore in the leg part such that the obturator means partially blocks both bores, the obturator means being such that when the T-piece is in use and air from a patient's lungs is blown into the T-piece from one end of the body part then some of the air misses the

obturator means and passes directly through the bore in the body part, and some of the air strikes the obturator means and is caused to pass down the bore in the leg part, around an end of the obturator means in the leg part and back up the leg part before carrying on through the bore in the body part, and the T-piece being such that in use the air passing around the end of the obturator means in the leg part flows over a fuel cell of the fuel cell gas sensor attached to the leg part whereby the fuel cell receives more air than it would have done in the absence of the obturator means and whereby the fuel cell sensor is then able to give more accurate and consistent readings than would do in the absence of the obturator means.

The present invention thus allows more accurate and consistent measurements from fuel cell gas sensors than would otherwise be obtained. Still further, the present invention accomplishes this in a particularly simple and elegant manner which enables T-pieces to be constructed to look like existing T-pieces, except for the provision of the obturator means, whereby surgeons, anaesthetists and other authorised persons do not have to get use to new looking equipment with which they may not feel comfortable. It is especially important in intensive care units which often administer nitric oxide to premature babies or adults having breathing problems and

where everything has to be done very speedily. In such circumstances, familiarity with equipment avoids undue delay and possible loss of life.

Preferably, the obturator means has a pair of concave sides. Also preferably, the obturator means has a curved top. The concave sides may be parallel to each other except adjacent the curved top where the concave sides diverge until they engage the curved top.

The T-piece may be one in which the obturator means is separately formed from the body part and the leg part, and is then fixed in position in the bore of the body part and the bore of the leg part. The separately formed obturator means may be fixed in position by being stuck with an adhesive. Other means of fixing the obturator means in position may be employed if desired and, also, the obturator means can be produced as an integral part of the body part and the leg part.

The T-piece of the present invention will usually be made of a plastics material. The plastics materials currently used for making known T-pieces will usually be used.

The T-piece can be made in any suitable and appropriate sizes so that, for example, it can be made for connection to 22m tubing for use with an adult, or for connection to 15mm tubing for use with a child.

An embodiment of the invention will now be described solely by way of example and with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a T-piece of the invention;

Figure 2 is an exploded view of the T-piece as shown in Figure 1; and

Figure 3 shows the T-piece of Figure 1 in use with a fuel cell gas sensor in a ventilation circuit for ventilating a patient's lungs.

Referring to the drawings, there is shown a T-piece 2 for use with a fuel cell gas sensor 4 in a ventilation circuit 6 for ventilating a patient's lungs.

The T-piece 2 comprises a body part 8, a through bore 10 in the body part 8, a leg part 12 which extends at right angles from the body part 8, and a bore 14 in the leg part 12 which communicates with the bore 10 in the body part 8. As so far described, the T-piece 2 is constructed the same as a known T-piece.

In accordance with the present invention, the T-piece 2 is provided with obturator means 16 which is positioned in the bore 10 in the body part 8, and also in the bore 14 in the leg part 12, see Figure 1.

The obturator means 16 is so positioned in the bores 10, 14 that it partially blocks both bores 10, 14.

The obturator means 16 is also such that when the T-piece 2 is in use and air from a patient's lungs is blown into the T-piece 2 from one end 18 of the body part 8, then some of the air misses the obturator means 16 and passes directly through the bore 10 in the body part 12, and some of the air strikes the obturator means 16 and is caused to pass down the bore 14 in the leg part 12, around an end 20 of the obturator means 16 in the leg part 12 and back up the leg part 12 before carrying on through the bore 10 in the body part 8. In Figure 3, in an enlarged portion 22, the air passing directly through the bore 10 in the body part 8 is shown by line 24. The air that is caused to pass along the bore 14 and around the end 20 of the obturator means 16 is shown by two lines 26.

The T-piece 2 is such that in use the air passing around the end 20 of the obturator means 16 in the leg part 12 flows over a fuel cell 28 of the gas sensor 4. The gas sensor 4 as shown in Figure 3 has a transducer part 30 connected to the T-piece 2 and a control and readout part 32 connected to the transducer part 30 by a cable 34. Due to the use of the obturator means 16, the fuel cell 28 receives more air than it would have done in the absence of the obturator means 16. Thus the gas sensor 4 is able to give more accurate and consistent

readings than it would do in the absence of the obturator means 16.

As can be seen from Figures 1 and 2, the obturator means has a pair of concave sides 36 and a curved top 38. The concave sides 36 extend parallel to each other except adjacent the curved top 38 where the concave sides 36 diverge and engage the curved top 38.

The obturator means 16 is separately formed from the remainder of the T-piece 2 and it is stuck in position in the bores 10, 14 using a suitable adhesive, for example provided on the convex sides 40 of the obturator means 16.

The ventilation circuit 6 shown in Figure 3 is basically a standard ventilation circuit apart from the provision of the T-piece 2 and so the ventilation circuit 6 will not be described in detail. As can be seen from Figure 3, the ventilation circuit 6 comprises a nitric oxide cylinder 42, gauges 44, 46, flow meters 48, 50 and an oxygen blender 52 which receives air along a pipe 54 and oxygen along a pipe 56. The ventilation circuit 6 also comprises a control module 58 and a mouth piece 60 which is connected to the T-piece 2 and through which a patient blows.

It is to be appreciated that the embodiment of the invention described above with reference to the accompanying drawings has been given by way of example

only and that modifications may be effected. Thus, for example, the obturator means 16 may be of a different shape than shown and/or it may be provided with one or more apertures in the area 62 for allowing more or less air to pass directly through the bore 10 in the body part 8. The T-piece 2 can also be used with different types of apparatus to that shown in Figure 3.

CLAIMS

1. A T-piece for use with a fuel cell gas sensor, which T-piece comprises a body part, a through bore in the body part, a leg part which extends at right angles from the body part, a bore in the leg part which communicates with the bore in the body part, and obturator means which is positioned in the bore in the body part and in the bore in the leg part such that the obturator means partially blocks both bores, the obturator means being such that when the T-piece is in use and air from a patient's lungs is blown into the T-piece from one end of the body part then some of the air misses the obturator means and passes directly through the bore in the body part, and some of the air strikes the obturator means and is caused to pass down the bore in the leg part, around an end of the obturator means in the leg part and back up the leg part before carrying on through the bore in the body part, and the T-piece being such that in use the air passing around the end of the obturator means in the leg part flows over a fuel cell of the fuel cell gas sensor attached to the leg part whereby the fuel cell receives more air than it would have done in the absence of the obturator means and whereby the fuel cell gas sensor is then able to give

more accurate and consistent readings than it would do in the absence of the obturator means.

2. A T-piece according to claim 1 in which the obturator means has a pair of concave sides.

3. A T-piece according to claim 1 or claim 2 in which the obturator means has a curved top.

4. A T-piece according to any one of the preceding claims in which the obturator means is separately formed from the body part and the leg part, and is then fixed in position in the bore of the body part and the bore of the leg part.

5. A T-piece according to claim 4 in which the separately formed obturator means is fixed in position by being stuck with an adhesive.

6. A T-piece according to any one of the preceding claims and which is made of a plastics material.

7. A T-piece for use with a fuel cell gas sensor, substantially as herein described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
GB 9404804.8

Relevant Technical Fields

(i) UK Cl (Ed.N) A5T (TAD, TDJ, TDK, TDX); G3H (HCA, HCX)

(ii) Int Cl (Ed.6) A61M 13/00, 16/00' F15D 1/00, 1/14

Search Examiner
L V THOMAS

Date of completion of Search
20 JUNE 1995

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI

Documents considered relevant following a search in respect of Claims :-
1-7

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

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